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ABSTRACT

This paper lists 35 studies in biology which can be tailored to suit the full range of student age groups and are designed to involve most or all of the key elements of the scientific process (study design, data collection and presentation, and experimental manipulation). Examples of some studies are: (1) study the growth of molds on food items under different growing conditions; vary foods and growing conditions; (2) study absenteeism in school; relate to colds, flu, other illnesses; (3) visit a local pond where bats forage at dusk; time of arrival of the bats on different nights and compare with time of year; estimate insect abundance by counting sudden changes of flight direction; and (4) conduct a behavioral study of your companion animal(s) at home: e.g., to what sounds do they respond; compare response to different vocal inflections; examine play behavior, etc. (MKR)

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HUMANE SCIENCE PROJECTS

Suggestions for Biology Studies that are Scientifically Educational and Ethically Non-Controversial

compiled by Jonathan P. Balcombe, Ph.D., Assistant Director for Education
The Humane Society of the United States, 1995

Each of the studies below (of which limitless variations can be conceived) can be tailored to suit the full range of student age groups, and designed to involve most or all of the key elements of the scientific process (study design, data collection and presentation, experimental manipulation, etc.)

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- walk one's dog through the woods, then study the seeds that are dispersed by clinging to the dog's fur (if a dog is not available, an old blanket can be used instead)
- study the growth of molds on food items under different growing conditions; vary foods and growing conditions
- observe birds at a feeder: for example, which species eat together? which species leave when other species arrive? which species eat which seeds/fruits/berries and why?
- which bird species are attracted to which types of birdhouses and/or cover vegetation and why?
- count seeds on plants: how many seeds do different plants produce? how does number of seeds vary among seed pods on same plant? different plants of a single species? different species? why?
- survey a particular plant species for insect life; what sorts of adaptations do certain species have for living on this plant? (e.g., camouflagic coloration); monitor the number of insect visitors to a small cluster of flowers/plants: how does visitation change with time of day, year, weather, etc.?
- grow bean sprouts in commercial sprouters (beans and sprouters are available in natural food stores): compare growth rates of different types of beans, different lighting conditions; compare different sprouter designs; compare taste preferences of students
- sample plants from small plots in school ground (or backyard); relate their distribution to microhabitats, student activity patterns, etc.

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- conduct an invertebrate catch/release (outside) operation in your home; list all the invertebrates (spiders; flies; ants; millipedes; cockroaches; moths; fleas; etc.) you find; describe their living preferences; survey your home for ways invertebrates might enter (including on you!)

- food preferences of ants: design a study involving placing different food items near the entrance to one or more ant colonies and recording behavioral responses of ants

- sample the soil in different habitats and (with the aid of a light microscope) survey the invertebrates (insects, earthworms, roundworms, etc.) found there; how do different habitats compare? different soil depths?

- comparative study of plants: e.g., two populations of dandelions (one growing in an undisturbed area, the other in a more disturbed area) (examples of data that could be collected: stem length, seed number, density, leaf area, seed plume length and width, etc.) (advanced classes could relate the data to r and K selection)

- collect, grow and study bacterial cultures from various places; example: garbage cans, doorknobs, mouth; compare bacteria in mouth before and after brushing

- study leafing patterns of trees/bushes: which species do/don't drop their leaves for the winter? which drop their leaves the soonest? which leaves do/don't change color? why?

- prepare an arboretum of plants growing on the school property

- observe nesting birds (e.g., watch nest for hour each day; estimate number of insects consumed, based on number of trips to/from nest; extrapolate over all the daylight hours); do males or females perform the same amount of each parental duty?

- study absenteeism in school; relate to colds, flu, other illnesses

- use a water analysis kit to test water at various points along a river or stream, to associate bacterial contaminants and other things (turbidity) with sewer plants, run off, etc.

- physiological self-study: e.g., test hearing directionality by blindfolding fellow student and tapping a metal object to right, left, front and back of blindfolded subject; test smelling/tasting accuracy of students (e.g., using juice from various fruits)

- investigate leaf and leafing adaptations (e.g., relate leaf shape and area to habitat; effects of light availability)

- habitat analysis in a local piece of wild land; what types of trees are there? what types of animals are there? how might they interact?

- survey road kills: relate to different locales (rural/urban), road types (paved/unpaved; two lane/four lane); solutions? (caution: for health and safety reasons, animal carcasses should not be handled directly)

- develop an ethogram (complete behavioral repertoire of a species)

- compare the behavior of ducks at a pond where they are fed by humans and at a pond where they are not

- find a roosting tree of starlings (or other gregarious bird species): determine from what direction most of the birds enter/leave the roost; [starlings are an excellent species for observational study; they are abundant, very active, intelligent, social, vocal, opportunistic, etc.]

- put up a bright light to attract bugs to a white sheet: identify the bugs while they are on the sheet; are the bugs the same in different areas?

- grow individual plants in different conditions and study and compare their growth patterns; example: change lighting conditions (direction; amount; timing)

- visit a local pond where bats forage at dusk: time the arrival of the bats on different nights and compare with time of year (official sunset data can be obtained from local weather station); estimate insect abundance by counting sudden changes of flight direction in bats (attacks); etc.

- do transects of natural areas, identifying and comparing the types and numbers of birds or other animals

- compare the fauna of organic farms with farms where pesticides are used; relate to current trends towards organic farming

- examine air pollution by sampling (say, by rubbing them with white tissue paper) the surfaces of tree leaves (or building surfaces,...) in different areas of a city; if you live near an industrial incinerator, you might compare samples taken at different distances (100 yards, 1/2 mile, 5 miles, etc.) from the incinerator

- maintain a compost pile and study the invertebrates that live in it

- compare trunks of dead with living trees in a wooded area: e.g., compare woodpecker holes, fungal growth

- conduct a behavioral study of your companion animal(s) at home: e.g., to what sounds do they respond; tape record different voices and monitor animal's response when played back (i.e., visual stimuli have been eliminated); compare response to different vocal inflections; observe closely sleeping pet and monitor body movements; frequency of REM sleep; prepare an ethogram that reflects the different personality of different individual cats/dogs; examine play behavior; etc. (a video camera may be very useful for such studies)

- measure the heights of students in the class: conduct a statistical analysis (mean height, standard deviation, significant differences based on age, or sex?; compare statistics for small and large groups of students)

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